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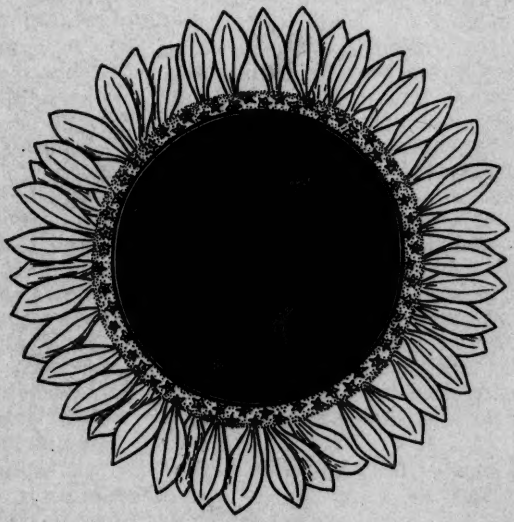

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NEW SPECIES OF NORVELLINA (HOMOPTERA, CICADELLIDAE)

DALE R. LINDSAY*

Norvellina bicolorata var. **inflata** n. var.

Closely resembling **N. bicolorata** (Ball) but readily separated by shorter length, extremely inflated front, usually fumate or whitish eyes, and normally immaculate, lemon-yellow elytra anterior to apex of clavus. Fuscous markings decidedly lighter and more sparse. Length 5 to 5.5 mm., width about 1.5 mm.

Vertex inflated, broadly rounding, slightly more produced at center than next eyes; highly arched behind transverse depression. Front bulbously inflated meeting plane of vertex at obtuse angle. Pronotum highly arched to horizontal scutellum.

Color: Vertex pale ivory to whitish, with two median spots of fuscous on anterior margin and a similar spot behind each ocellus; each half of disc posterior to transverse depression centered with a triangle of fuscous vermiculations. Front above matching background of vertex. Pronotum fuscous vermiculate with fumate to white background; the fuscous darker on anterior margin, especially touching eyes, and omitting irregularly patches of light background. Scutellum mostly light brown with white lateral margins except for fuscous spots on the margin posterior to transverse suture. Elytra anterior to apex of clavus usually bright lemon-yellow, sometimes faded to whitish; beyond clavus whitish, nearly hyaline, with fuscous veins and sparse vermiculations, the extreme apical portion solidly fuscous except for hyaline margin and one round spot on tip of third apical cell.

Genitalia: As in **N. bicolorata** (Ball) except for slightly more slender aedeagus, apical beak shorter and less recurved and base not so heavy.

Holotype male, allotype female; White Sands, N. M., June 30, 1932, R. H. Beamer. Numerous paratypes from the following localities: Grand Canyon, Ariz.;

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Las Cruces, N. M.; Mojave, Calif.; Tucson, Ariz.; Yucca Grove, Calif.; Jacumba, Calif., Palmdale, Calif.; St. George, Utah; and Las Vegas, Nev. Types and paratypes in the Snow Entomological Collection. Paratypes in collection of Dr. Ball and U. S. N. M.

Norvellina mildredae var. **minuta** n. var.

Closely resembling mildredae in all respects except size and distribution. Small specimens, female 4.75 mm. long and male 4 mm.

Genitalia: Styles and aedeagus shaped as in **mildredae** but about half as large. Pygofer about two-thirds as large as **mildredae.**

Holotype male, allotype female, and one male paratype from Ozona, Tex., July 9, 1936, R. H. Beamer. These miniature **mildredae** are so strikingly smaller than the true species as to warrant varietal ranking. In addition their habitat on the open, arid plains indicates that they are probably from a different host than the montain **Mildredae** taken on red cedar and, according to Ball, found only in sheltered situations.

Norvellina flavida n. sp.

Closely resembling **N. pulchella** (Baker) but easily distinguished by the broadly suffused, canary yellow corium anterior to costal plaque, vertex not so produced and more rounding, with generally lighter markings on disc. Pygofer hook vestigial. Length of female about 5 mm.; male 4.75 mm.

Vertex scarcely produced at center in males, more distinctly in females with definite margin; only slightly arched behind transverse depression. Pronotum slightly arched in lateral view. Elytra long, overlapping.

Color: Front yellow streaked with brown, yellow extending slightly over margin of vertex. Vertex with four brown spots near anterior margin with a similar spot behind transverse depression. Pronotum fuscous, omitting a sprinkling of light areas and irregular, yellowish lateral margins. Scutellum about like pronotum slightly lighter. Elytra with median pattern composed of brown background covered with fuscous vermiculations extending over most of clavus to apex, and spreading laterally to margin at costal plaque, omitting three pairs of small

round semi-hyaline aereoles on mesal margin; elytron distal to clavus with lighter continuation of pattern to apex, mostly in third and fourth apical cells.

Genitalia: Female ultimate segment more than twice length of preceding, rounding posteriorly from lateral margins, slightly produced at center with median notch sinuate either side. Male plates long-triangular, acuminate at apices. Styles longer than usually on distally narrowed portion, rounding on inner margin. Aedeagus in lateral view sharply curved dorsally, tapering on distal half to dorso-ventrally flared apex, about four times broader than shaft next apex; a pair of ventrolateral processes arising at base and tapering to a little past apex of shaft, more curved at tip. Pygofer almost triangular, hook vestigial.

Holotype male, allotype female, 18 miles N. W. Ft. Stockton, Tex., July 11, 1936, R. H. Beamer. Paratypes from following localities: 8 males, 4 females, as above; 4 males, 47 mi. W. Sheffield, Tex., July 10, 1936; 7 males, 16 females, Rodeo, N. Mex., June 8, 1933; 1 male, 1 female, Sheffield, Tex., July 10, 1936; 1 male, 1 female, Las Cruces, N. Mex., July 1, 1932; 1 male and 1 female, Satillo Coahuila, Mex., Nov. 21, 1932; 1 female each from Santa Rita Mts., Ariz., July 17, 1932, and Davis Mts., Tex., June 2, 1937; and 1 male, Hope, N. Mex. Types and paratypes in Snow Entomological Collection. Paratypes in U. S. N. M. and collection of Mrs. J. N. Knull.

Norvellina vermiculata n. sp.

Closely resembling **N. saucia** (Ball) but with median pattern lighter and composed of coarsely reticulate vermiculations over a light background; veins on corium dark and interspersed with light vermiculations. Length about 4.75 mm.

Vertex obtusely angulate in females, distinctly more produced at center than next eyes; males more rounding.

Color: Vertex with four irregular brown spots near anterior margin and one behind each ocellus on ivory to cream-colored background; discs posterior to transverse depression usually vermiculate with brown. Pronotum vermiculate with brown except for light areas along anterior and lateral margins and on disc so that there often appears to be three longitudinal light lines on pronotum. Scutellum tawny to brown omitting numerous light spots. Elytra as above, apices sparsely vermiculate.

Genitalia: Ultimate female segment twice longer than preceding, sloping inward on posterior half of lateral margins; posterior margin truncate with short, slightly bifid, wedge-shaped median tooth, shallowly notched at either side. Male valve obtuse, over half length of preceding segment; plates triangular, about twice as long as basal width, slightly attenuate at apices. Aedeagus in lateral view short, curved dorsally, rounding on outer margin near apex, slightly constricted to apical head bluntly pointed on inner margin; a pair of ventrolateral processes. Pygofer twice longer than median width, narrowed posteriorly with hook attached on posterior margin, free portion extending dorsally half the length of hook.

Holotype male, allotype female, and four male paratypes, Berger, Idaho, June 15, 1931, Wind vane trap. Other paratypes as follows; two males, Hansen, Idaho, June 22, 1931; five males, Hollister, Idaho, June 22, 1931; two females, Promontory, Utah, Aug. 6, 1930, on Atriplex, G. F. Knowlton, Collector; two males, Murtaugh, Idaho, June 23, 1931; one female each from Wendell, Idaho, June 14, 1934, A tridentata, and Haberman, Idaho, Blue Gulch, Sept. 4, 1932; and one male each from Burley, Idaho, June 23, 1931; Jerome, Idaho, July 8, 1932; Castleford, Idaho, July 11, 1932; and Maybell, Colo., June 30, 1931, R. H. Beamer. Types and paratypes in U. S. N. M. and paratypes in Snow Entomological Collection.

Norvellina varia n. sp.

Closely resembling **N. saucia** (Ball) but with the pronotum more heavily infuscate and the general color pattern more reddish-brown. Length, females about 5 mm., males 4.75 mm.

Vertex distinctly more produced at center than next the eyes, transverse depression usually distinct, posterior disc slightly inclined in lateral view. Pronotum moderately arched in lateral view. Elytra relatively narrow; specimens in dorsal view not appearing as plump as in **saucia.**

Color: Vertex with four elongate, light brown spots near anterior margin with a similar spot behind each ocellus; posterior to transverse depression usually sparsely vermiculate with tawny brown on ivory background.

Pronotum heavily infuscate except for narrow lateral margins and omitting numerous light spots, especially on anterior margin between the eyes. Scutellum with triangular reddish areas on lateral corners, the center more brown and the two colors separted by linear light spots. Elytra with median pattern as in **saucia** but darker, composed of tawny-brown background heavily irrorate with mahogany; distal portion sparsely vermiculate with fuscous over ante-apical cells, more heavily on third and fourth apical cells.

Genitalia: Ultimate female segment about twice length of preceding, posterior margin gently rounding with a very short tooth either side of a shallow median notch, slightly sinuate at either side. Male valve obtuse; plates long-triangular, nearly acuminate on distal half. Aedeagus in lateral view stout, curved dorsally on basal half, distal half nearly straight and ending in bluntly rounded apex; two slender ventrolateral processes arising at base and extending slightly beyond apex, mostly free of shaft. Pygofer broad, sloping distally toward dorsally extended hook arising on posterior margin and with free portion about equal to posterior width of pygofer.

Holotype male, allotype female, Pasadena, Calif., July 31, 1912, E. D. Ball; one male paratype, Pasadena, Calif., April 23, 1908; four paratypes, Ontario Calif., June 14, 1931, E. D. Ball. Types and paratypes in Dr. Ball's collection and paratypes in Snow Entomological Collection. Other specimens are at hand from Three Rivers, Pine Valley, San Jacinto Mts., Campo, San Gabriel Canyon, and Colfax, Calif., and Cisco, Utah, but all showing slight variations and for this reason are not included in the paratypes series. The apparent tendency of this form to vary in shape of and markings on vertex, while genital structures remain constant, accounts for its specific name.

Norvellina numerosa n. sp.

Closely resembling **N. saucia** (Ball) externally, but usually darker on median pattern with lateral margins irregularly bordered with dark fuscous and aedeagus in lateral view, short and thick, more evenly curved and with processes much longer than shaft. Length of female about 5 mm., male 4.75.

Vertex obtusely angulate on anterior margin; in lateral view with shallow transverse depression and posterior disc slightly inclined. Pronotum, in lateral view, scarcely arched. Elytra moderately broad giving specimens stout appearance.

Color: Vertex pale ivory or whitish with four very small brown dots on anterior margin and a similar dot, usually elongate, behind each ocellus; with sparse, sometimes indistinct, vermiculations back of transverse furrow. Pronotum light along lateral margins and in irregular patches on anterior margin, the remainder vermiculate with brown, distinctly or lightly, usually appearing tri-lineate longitudinally with fumose white. Elytra as in **saucia** but darker, usually fringed with irregular fuscous border.

Genitalia: Ultimate female segment twice length of preceding, rounding on posterior margin with a distinct median notch and a smaller notch on either side. Male valve obtuse, plates long-triangular, slightly attenuate. Aedeagus in lateral view much as in **N. varia** n. sp. but shorter and thicker, with ventrolateral process extending about one-sixth beyond apex of shaft. Pygofer a little longer than median width with a slender, straight hook broadly attached on posterior margin at an angle of about forty-five degrees with the extended plane of the ventral margin.

Holotype male, allotype female, one male and two female paratypes, Prescott, Ariz., July 29, 1933, R. H. Beamer. Numerous other paratypes from the following localities: Prescott, Yarnell Hts., Yarnell, Superior, Oracle, Tucson, Williams, Granite Dell, Yavapai Co., Congree Jct., and Glenn Oaks, Arizona; San Jacinto Mts., Tehachapi, Orange Co., Laguna Mts., Doyle, Mojave, Chilcoot, Newton, Los Angeles Co., and Fresno, Calif.; Silver City, N. Mex.; Las Vegas, Nina, Alamo, Wells, and Glendale, Nev.; Pintura, St. George, Modena, and Granite, Utah. Types and paratypes in Snow Entomological Collection; additional paratypes in Dr. Ball's collection and in U. S. N. M.

This species and the three preceding species make up a closely related group, which, for convenience, might be called the **saucia** group, since all the above species have at various times been placed in with **N. saucia** (Ball) due to a lack of stable and distinguishing characters.

Only with the use of male genitalia is definite separation possible, since external appearance intergrade promiscuously, sometimes with one combination of characters and sometimes with another, but in the main as described. In selecting types the author chose those specimens possessing the largest number of stable external characters in hopes that the majority of specimens in this group can be thus keyed out. By far the larger number of specimens heretofore classified as **N. saucia** (Ball) belong in this latter species and suggested the specific name.

Norvellina excavata n. sp.

Closely resembling **N. pulchella** (Baker) but with infuscated area on posterior disc of vertex not extending to transverse furrow, the anterior margin of this area with small, rounded excavations each side of median line and conspicuously separated from dots near anterior margin of vertex. Length about 5 mm.

Vertex rounding to front, more produced at center than next the eyes; transverse depression very shallow, disc slightly inclined posteriorly.

Color: Vertex ivory to tan with four very small brown spots on anterior edge of transverse furrow and a slightly elongate spot behind each ocellus; approximately the basal half of vertex with brown to fuscous pattern omitting irregular, small whitish spots; anterior margin of pattern with a small rounded indentation either side of median line. Dorsum of species with typical saddle marking.

Genitalia: Ultimate female segment about twice length of preceding, posterior third of lateral margins rounding posteriorly and nearly straight across on posterior margin, with a slightly bifid, median projection notched on either side about half the length of the projection. Male valve obtuse, plates long-triangular, over twice the length of basal width. Aedeagus in lateral view of medium length, curving dorsally with sharply incurved, bluntly rounding apex; two ventrolateral processes arising near base and extending about five-sixths the length of shaft, the distal one-third somewhat spear-headed, with tips turning slightly outward from shaft. Pygofer narrowing sharply on distal half with a long, stout hook extending dorsally and back at about an angle of thirty degrees with the plane of the ventral margin.

Holotype male, allotype female, Valentine, Tex., July 13, 1927, R. H. Beamer, and paratypes as follows: One male, Ozona, Tex., July 9, 1936, R. H. Beamer; one female, Hildago Co., Tex., July 28, 1928, A. M. James; one female, Davis Mts., Tex., June 2, 1937, D. J. and J. N. Knull; and one male, Uvalde, Tex., Aug. 4, 1937, D. J. and J. N. Knull. Types and paratypes are in the Snow Entomological Collection, and paratypes in the collection of Mrs. J. N. Knull.

Norvellina rostrata n. sp.

Resembling **N. varia** n. sp., but usually a little darker on median pattern, vertex more angulate and produced at center, transverse depression indistinct, and aedeagus in lateral view broad and beak-like in appearance. Length of male 5 mm., female 5.5 mm.

Vertex angulate from dorsal view, in lateral view margin rounded but distinct, with only a suggestion of a transverse furrow and sloping upward from anterior to posterior margin. Pronotum moderately arched in lateral view. Elytra long and narrow.

Color: Vertex mostly brown, omitting whitish to ivory areas along anterior margin and in irregular patches on disc; customary spots along anterior margin modified to more or less indistinct extensions of brown pattern. Pronotum brown on median portion, shading to fuscous on lateral thirds excluding an irregular, light lateral margin and numerous light spots sometimes fused. Scutellum brown to fuscous omitting numerous light spots and a light ivory, triangular spot at each end of transverse suture. Elytra with typical saddle pattern, light margin of basal clavus along claval suture opaque white, basal corium mostly hyaline allowing yellow wall of abdomen to show through distinctly; elytra beyond clavus semihyaline covered with fuscous vermiculations, sparse near clavus but heavier in extremes of third and fourth apical cells, omitting a hyaline area along the median margin in the fourth.

Genitalia: Ultimate segment of female at least twice the length of the preceding segment, rounding strongly on lateral margins; posterior margin strongly produced to a small median notch, sinuate on either side. Male valve obtusely rounding; plates long-triangular, outer margins broadly indented about one-third distance to apices. Aedeagus in lateral view appearing broad

and beak-like, width about one-third of length; width due to a thin, membranous, keel-like extension on outer margin; base thickened dorso-ventrally with a pair of processes arising on outer margin and extending along outer edge of membrane to apex of shaft. Pygofer less than twice length of median width, broadly rounded posteriorly with an irregular hook curved along posterior margin.

Holotype male, allotype female, and two paratypes, male and female, Lucerne, Calif., July 17, 1935, R. H. and Jack Beamer. Types and paratypes are in the Snow Entomological Collection.

Norvellina curvata n. sp.

Resembling **N. pullata** (Ball) but darker and with median pattern extending uniformly from base to apex of clavus and composed of fuscous irrorations and vermiculations. Length of male about 5.25 mm., female about the same length but broader.

Vertex obtusely angulate on anterior margin, in lateral view margin definite, transverse depression shallow, disc inclined posteriorly. Pronotum only slightly arched in lateral view. Scutellum slightly inflated at apex. Elytra of moderate width.

Color: Vertex with whitish to fumose background upon which are four rather large, irregular, light brown spots near anterior margin and a smaller spot behind each ocellus; remainder of disc brown vermiculate over lighter background. Pronotum reticulate with brown or fuscous, omitting a whitish line on each lateral margin and numerous fumose to whitish areas on disc. Scutellum more heavily reticulate, usually with lateral corners and all but extreme apex of apical corner darker and with a roughly triangular light spot at each end of the transverse suture. Elytra with **Norvellina** type median pattern, composed of fuscous irrorations and vermiculations, heaviest on lateral margins and extending to claval suture on clavus; elytra posterior to clavus sparsely vermiculate, heavier in apices of second and third anteapical cells and third and fourth apical cells.

Genitalia: Ultimate female segment round to angulate on lateral-posterior corners, posterior margin truncate with a slight bifid median projection. Male valve obtusely rounding; plates long-triangular, slightly acuminate at tip. Aedeaius in lateral view long, sharply curved dorsally near middle, apex rounding on outer margin to short inward tooth on inner margin; two lateral

processes arising basally and extending very nearly to apex, closely appressed to shaft. Pygofer large, rounding posteriorly on inner margin to a strong hook attached on posterior margin and directed dorsally, free portion as long as posterior width of pygofer.

Holotype male, allotype female, one male and two female paratypes, Grand Teton Nat'l Park, Aug. 18, 1931, R. H. Beamer. Types and paratypes are in the Snow Entomological Collection.

Norvellina glauca n. sp.

Resembling **N. clarivida** (Van D.) but barely tinged with green, with a longer vertex and with spots near anterior margin minute and light brown. Length of male 4.5 mm., female 5.25 mm.

Vertex angulate, posterior margin rounding, considerably more produced at center than next eyes; in lateral view anterior margin rather sharp, transverse depression broad, in female disc nearly concave. Pronotum short, rounding to front, nearly truncate behind. Elytra moderately long.

Color: General color grayish white slightly tinged with green. Vertex whitish to pale ivory with four small light brown spots near anterior margin, sometimes a faint spot behind each ocellus. Pronotum mottled whitish to ivory, occasional faint brown spots on disc, usually behind the eyes. Scutellum about the color of the vertex. Elytra whitish, sprinkled with light brownish to tan vermiculations, obscurely in the Norvellina pattern, slightly more definite on costal and apical margins.

Genitalia: Ultimate female segment about twice length of preceding, gently rounding posteriorly on lateral margins; posterior margin sinuate, produced at center into a long, slightly wedge-shaped projection notched at apex. Male valve roundingly obtuse, plates long-triangular, nearly acuminate apically. Styles on narrowed distal portion short angulate at apex to point on outer margin. Aedeagus in lateral view curving dorsally with inwardly pointing, avicephaliform apex; two broad lateral processes arising at base and extending the length of shaft, apices constricted to inwardly bent point. Pygofer less than twice length of median width, tapering toward a dorsally projecting, fragile hook attached to posterior margin.

Holotype male, allotype female, and two paratypes, male and female, Cuyama Ranch, Calif., July 25, 1935,

R. H. Beamer. Types and paratypes in the Snow Entomological Collection.

A REPORT ON SUPELLA SUPELLECTULIUM (SERVILLE) (ORTHOPTERA, BLATTIDAE)

THOMPSON C. LAWRENCE*

The author observed **Supella supellectulium** (Serville) at Fort Leavenworth, Kansas, in the fall of 1933. These roaches were found in a kitchen and pantry, **Blattella germanica** greatly outnumbering them in the vicinity of the sinks. **S. supellectulium** does not climb glass as well as **B. germanica** but seems to be a more active insect, a better jumper, and, in the males, a better flyer. The Supella's egg sacks are generally attached to sheltered woodwork. Its molted skins, unlike those of its German relative, are often found about its hiding places. It was collected from two houses in Lawrence, Kansas, in 1936.

In the American tropics it is the common household pest, having, no doubt, been introduced from the Old World. It is now worrying exterminators in Atlanta, Georgia, and other southern cities in Texas and Arizona and in the State of Illinois. Probably it is much more widespread than is at present believed, its size and general coloration causing it to be confused with the German roach.

In the summer of 1936 the Fort Leavenworth house from which they were first reported was closed from July tenth to August fifteenth. The outside temperature during this period averaged 82.5 degrees Fahrenheit, the average maximum temperature being 98.17 degrees. The temperature reached 109 twice, and mounted to 112, 111, and 108 successively on the last three days the house was vacant. No roaches at all were then seen until mid-November 1937 when an occasional well-grown **B. germanica** was discovered. A young **Supella supellectulium** was seen during the Christmas holidays. Young German roaches were observed at this time in numbers. This would indicate that no artificial heating devices would be necessary to kill these pests during very hot weather, closure of the building for a more or less extended period being sufficient.

*Contribution from Department of Entomology, University of Kansas.

NEW FORMS AND SUBSPECIES OF NORTH AMERICAN LIBYTHEIDAE AND LYCAENIDAE

WILLIAM D. FIELD, Lawrence, Kansas*

Libythea bachmanii Kirtland

Although the fact is usually not recognized there are two subspecies of **Libythea bachmanii.** The typical subspecies, **Libythea bachmanii bachmanii,** described from a specimen taken in Northern Ohio, ranges from Ontario and New England through the Mississippi Valley south to the Gulf. The description of typical **bachmanii** is given below. Upper surface: The orange brown spot in the cell of the fore wing is separated from the patch of the same color in interspaces Cu^1 and Cu^2 by a narrow brown stripe. Sometimes this stripe is greatly reduced but if this is the case the veins in this region are distinctly lined with brown. That portion of the largest subapical white bar which lies next to the costal margin is narrower than the rest of the bar but does not lie closer to the base of the wing than the remainder of the bar. In the male these white subapical spots are sometimes slightly tinged with red. Under surface: The orange maculation in the fore wing consists of one large orange spot covering the cell and extending outward in interspaces Cu^1 and Cu^2 to within about 5 mm. of the outer margin. The cubital veins are sometimes black but there is never a wide distinct brown or black stripe below the cell. The largest subapical white bar of the upper surface is reproduced on the lower surface.

There are two forms of this subspecies that differ chiefly in the coloration and maculation of the under surface. In one, the apex of the fore wing, the outer borders and the entire hind wing are dark grayish brown with a distinct purplish tinge; there is very little black mottling, and no white mottling except sometimes for a whitish ray in the base of the hind wing along vein Cu^1+M^3. This form is named **kirtlandi** (f. nov.) after the describer of the typical subspecies.

Types.—Holotype, ♂, Lawrence, Kansas, August 1, 1935, collected by R. H. Price; allotype, ♀, same locality and collector, July 27, 1935; paratype no. 1, ♀, same locality, collector and date; paratype no. 2, ♀, Eureka,

*Contribution from the Dept. of Entomology, University of Kansas.

Kansas, Summer, 1934, Fritz Forbes; paratype no. 3 and no. 4, ♀ ♀, same data as paratype no. 2; paratype no. 5, ♀, Leavenworth Co., Kansas, no date, Henry Thomas; paratype no. 6, ♀, Sharon Springs, Wallace Co., Kansas, August 3, 1910. Paratype no. 6 in the Francis Huntington Snow Entomological Collections, University of Kansas. All other types in the author's collection.

The other form of this subspecies is typical **bachmanii.** On the under surface in this form the apex and outer angle of the fore wing are whitish gray heavily mottled with dark brown. Between the anal angle and the apex the marginal border is dark brown. The hind wing is very light gray heavily mottled and reticulated with brown and black tinged with violet or blue. The brown mottling is unusually heavy near the outer margin and across the middle of this wing forming two faint brown bands, one mesial and the other submarginal in position. This dimorphism in the typical subspecies of **bachmannii** (just described) has been noticed by a number of workers but was thought by them to represent merely the normal sexual differences. The form here described as **kirtlandi** was thought to represent the male sex. This form and typical **bachmanii** are found in about equal numbers in both sexes.

The second subspecies of **bachmanii** has been incorrectly referred to by many writers as a dimorphic form. It was described from southwestern Texas (New Braunfels and San Antonio) as a new species under the name of **Libythea larvata** by Herman Strecker.[1] It occurs from Texas through New Mexico and Arizona and south into Mexico. **Libythea bachmanii larvata** differs from **Libythea bachmanii bachmanii** in a number of distinct characters. Upper surface: In the fore wing the brown stripe separating the orange brown spot of the cell from the spot in interspaces Cu^1 and Cu^2 is very distinct and wider than it is in **Libythea bachmanii bachmanii.** In this same wing, that portion of the largest subapical white bar which lies next the costal margin is distinctly narrower than the rest of the bar and is placed nearer the base of the wing than the rest of the bar. The orange patch in the hind wing is somewhat larger than in typical **bachmanii.** Under surface: The cell of the fore wing is

1. Rhop. Het., I, p. 130, 1877.

orange. The light spot between the cell and the inner angle in interspaces Cu^1 and Cu^2 is white (not orange) and sometimes very faintly flushed with yellow. This spot is separated from the orange cell spot by a band of brown which runs from the base of the wing to the brownish black area surrounding the subapical white spots. The white bar between the costal margin and vein M^3 of the upper surface is reproduced on this surface.

The subspecies **larvata** is also dimorphic. The typical form corresponding to the typical form of the subspecies **bachmanii** is even lighter in ground color on the under side of the hind wing and in the apex of the fore wing, being almost white and heavily mottled and reticulated with brown. This brown mottling forms two dark bands across the hind wing, one submarginal in position and the other mesial. There is a partial third band across the base of this wing.

The other form of **Libythea bachmanii larvata** corresponds to the form **kirtlandi** of the typical subspecies. It is lighter in ground color on the upper surfaces being gray (even lighter gray than in **kirtlandi**) with a purplish tinge and only slightly mottled or spotted with black scales. This form is named **streckeri** (f. nov.) after the author of the subspecies.

Types.—Holotype, ♂, Donna, Texas, November 10, 1935, Miss Calla Stainke; allotype, ♀, same locality and collector, November 11, 1935; paratype no. 1 and no. 2, ♂ ♂, same locality and collector, November 10, 1935. All types in the author's collection.

As in the subspecies **bachmanii** this dimorphism is represented in both sexes in about equal numbers.

Libythea carinenta (Cramer)

It was deemed advisable to include a description of this species because of the fact that it is often confused with **bachmanii** and **larvata.** The last two are sometimes placed as subspecies of **carinenta** and indeed, **larvata** has even been placed by one authority as a synonym of **carinenta. Libythea bachmanii** and **Libythea carinenta** are quite distinct species and are easily separated from each other. They differ not only in the form of the male genitalia but also in the shape of the hind wings and in the color pattern. The hind wings of **carinenta** are distinctly projected in the anal region, giving the adults quite

a distinctive appearance. The outer edge of the hind wing is straighter, or more even, than in either **bachmanii** or **larvata.** This is particularly true in the anal region. **Carinenta** differs in the color pattern in many particulars. Upper surface: The white bar between the costal margin and vein M^3 of the fore wing is here greatly reduced in size and distinctly broken, forming two spots. The white spot nearest the costal margin is very small and lies much nearer to the base of the wing, as is the case in **larvata.** The other subapical white spots are also somewhat smaller than in either **bachmanii** or **larvata.** The orange spot in the cell of the fore wing is smaller than in either of the above mentioned forms, occupying only the lower half of the cell next the base of the cubital vein. The orange patch in interspaces Cu^1 and Cu^2 is also much smaller and slightly lengthened toward the innner margin. These two orange spots are separated by a band of brown. This band is even wider than in **larvata.** The orange patch in the hind wing is variable, but it is always smaller than in either **larvata** or **bachmanii.** In some specimens it is present only in interspace M^1. Under surface: The white bar in the fore wing between the costal margin and vein M^3 is distinctly separated into two spots as it is on the upper side. The cell is entirely orange. The light spot in interspaces Cu^1 and Cu^2 is wider than it is on the upper surface and is white in color, or sometimes tinted with yellow. A wide dark brown bar separates this spot from the orange spot of the cell. The hind wings are lighter and more irridescent purplish in color than in **bachmanii** or **larvata.**

Libythea carinenta occurs from Mexico southward to Argentina and Paraguay and probably also occurs as a visitor in the southwestern part of the United State. This is evidenced by one specimen labelled "Texas", which is in the Francis Huntington Snow Entomological Collections.

Strymon melinus franki subsp. nov.

Male.—Under surface: Ground color whiter than in typical **melinus** (the subspecies occuring in the southeastern part of the United States) and lacking the distinct brownish hue. This color would have the position of 19 4-prime f in Ridgeway's "Color Standards", being a cross between pale smoke gray and pale drab-gray and in a few darker specimens between smoke gray and pale

smoke gray. The submarginal row of black bars is usually indistinct, particularly in the hind wings, being much lighter and smaller than in either **melinus** or **humuli** (the subspecies found in New England). The anal and subanal ochraceous-orange or rufous spots are much smaller than in **melinus melinus,** being about the size of those of **humuli.** The orange of the anal spot usually does not extend inward along vein 2nd A to the submesial row of black and white bars. The subanal orange spot does not extend inward as far as the submesial row of black bars or at least it does not fuse with the posterior half of the submesial black and white bar in interspace Cu^1, as is the case in typical **melinus.** The orange from this subanal spot usually only slightly colors the submarginal dark bar in interspace M^3. In most specimens the submesial row of black and white bars is lined on the inner side with a few dark red or orange scales, although this is usually not noticeable except upon careful examination. The chief character by which **franki** can be distinguished from **humuli** and **melinus** is in the irregular shape of this submesial row of bars above vein M^3. The bars of interspaces M^2 and M^1 are placed slightly outward from the rest, the bar in interspace R^1 is placed slightly inward, and the bar in interspace R is placed outward and lies in about the same position as do those of interspaces M^2 and M^1. The black speckled lunular shaped spot between the anal and subanal orange spots is smaller than in **melinus,** gray-blue in color and is rarely lined on its inner side with orange. Although this lunule is about the same size as that of **humuli** it differs from the one found in that subspecies in being light gray blue in color and heavily suffused with black. In **humuli** this spot is dark, about the same tone as the ground color of the wings (mouse gray or deep mouse gray) and with a bluish hue. Body: Like that of **S. melinus melinus** except that there is a little more salmon orange on the posterior part of the abdomen.

Female.—Differs from the male in having the abdomen entirely gray above and in having slightly more of the orange maculation on the wings.

This new subspecies is named for Thomas Frank, an enthusiastic young collector of New York City.

Types.—Holotype, ♂, Lawrence, Kansas, August 9, 1934, W. D. Field; allotype, ♀, same locality and collec-

tor, July 2, 1934; paratype no. 1, ♂, same locality and collector, August 2, 1933; paratype no. 2, ♀, same locality and collector, August 26, 1934; paratype no. 3, ♀, same locality and collector, August 6, 1934; paratypes no. 4 through 28, mixed sexes, same locality and collector, August 10, 1937. Holotype, allotype and paratypes numbers 1 through 10 and numbers 27 and 28 in the author's collection. Paratypes no. 11 and 12 in the Canadian National Collection, Ottawa. Paratypes no. 13 and 14 in the Francis Huntington Snow Collection, University of Kansas, Lawrence. Paratypes numbers 15 through 26 in the collection of F. Martin Brown, Colorado Springs, Colorado.

Note.—In addition to the type series and numerous other specimens of this new subspecies taken in Douglas County, Kansas, the author has examined specimens of typical **S. melinus franki** from the following localities: Kansas—Wallace, Scott, Clark, Pratt, Reno, Harper, Montgomery, Wilson, Crawford, Rawlins, Pottawatomie, Riley and Osborne counties; Oklahoma—Wichita National Forest and Davidson; Texas—Vernon, Sabinal, San Antonio, Castroville, Elmdorf, Ozona, Concan, Sheffield, Romney and Ft. Stockton; New Mexico—Malaga and White City; Colorado—Fountain, Rock Creek and Cascade (all in El Paso County).

Strymon falacer godarti subsp. nov.

Male.—Under surface: Ground color hair brown or chaetura drab as in typical **falacer.** The dark bars of the submesial row of both the fore and hind wing are thinner (about one-half as thick as they are in typical **falacer**) and more widely separated than in **S. falacer falacer.** These bars are outlined on their outer edges by white as is true of typical **falacer.** The bright submarginal markings present in the lower half of the hind wing are orange instead of orange red or red, and are larger and clearer than in typical **falacer.** This subspecies is quite similar to typical **falacer** in other respects.

Female.—Differs from the male in having the bars in the submesial row on the under surface even narrower, in having one or two additional submarginal orange spots on the under side of the hind wing, and sometimes in having two or more faint submarginal orange streaks on this surface of the fore wing.

This subspecies is named after the describer of the typical subspecies.

Types.—Holotype, ♂, and allotype, ♀, Rosement, Teller Co., Colorado, June 20, 1936, Wm. D. Field; paratypes numbers 1, 3, 5, 6, ♂ ♂, same data; paratypes numbers 2 and 4, ♀ ♀, same data; paratype no. 7, ♂, Crystal Creek, Teller Co., Colorado, July 27, 1931, F. M. Brown; paratype no. 8, ♂, Mt. Herman Road, El Paso Co., Colorado, July 6, 1933, F. M. Brown; paratype number 9 ♂, Tiny Town, Colorado, July 17, 1938, C. D. Schryver paratype number 10, ♂, Deckers, Douglas County, Colorado, July 10, 1938, C. D. Schryver. Holotype, allotype and paratype numbers 1, 2, 5, 6 and 10 in the author's collection. Paratype no. 3 and 4 in the Francis Huntington Snow Entomological Collections, University of Kansas, Lawrence, Paratypes no. 7 and 8 in the collection of F. Martin Brown, Colorado Springs, Colorado and paratype number 9 in the collection of C. D. Schryver Denver, Colorado.

Note.—Two males taken 7 mi. west of Piedra River, Archuleta Co., Colorado, July 20, 1934, Davenport and Whitmer and three males, Red Creek, El Paso Co., Colorado, June 28, 1937, W. D. Field (all in the collection of F. Martin Brown) are of this subspecies, but were not made part of the type series due to the fact that they are rather worn.

Callipsyche behrii crossi subsp. nov.

Male and female.—Under surface: The ground color is much darker, being more nearly drab and heavily dusted with black and white scales, instead of the smooth light drab of typical **behrii**; this is true particularly of the hind wings. There is a large submesial spot of orange or orange red in interspace Cu^1 of the hind wing and sometimes another, although much smaller one, in interspace M^3. In typical **behrii** only the spot in interspace Cu^1 is present, and it is much smaller and more yellowish than orange in color. The submarginal black spot in interspace Cu^1 of the hind wing and all submarginal black spots in both fore and hind wing are larger and more distinct than in typical **behrii**. The whitish suffusion along the outer margin of the hind wing found in typical **behrii** is here indistinct.

This subspecies is named after F. C. Cross of the Denver Museum of Natural History.

Note.—The author's concepts of typical **behrii** are based upon one hundred specimens of **behrii** from Mammoth in Mono County, California, near the type locality which is Mono Lake, and upon the colored illustration of the male type by Dr. W. J. Holland (The Butterfly Book, plate XXX, figs. 4, 5).

Types.—Holotype, ♂, and allotype, ♀, Nederland, Colorado, July 19, 1936, C. D. Schryver; paratypes numbers 1, 2, 3, ♀ ♀, same data; paratype no. 4, ♂, and paratype no. 5, ♀, Colorado-Wyoming State Line, July 1, 1936, C. D. Schryver; paratype no. 6, ♀, Troutdale, near Eevergreen, Colorado, July 9, 1936, C. D. Schryver; paratypes numbers 7 and 8, ♀ ♀, Evergreen Colorado, July 26, 1936, C. D. Schryver; paratypes numbers 9 and 10, ♀ ♀, Poudre Canyon, Colorado, June 9, 1934; paratype no. 11, ♂, and paratype no. 12, ♀, Platte Canyon, Colorado; paratype no. 13, ♀, Chimney Gulch, near Golden, Colorado, July 5, 1936, F. C. Cross; paratypes numbers 14 and 15, ♀ ♀, Chimney Gulch, near Golden, Colorado, July 12, 1936, F. C. Cross; paratype no. 16, ♀, Lookout Mountain, near Golden, Colorado, June 21, 1936, R. H. Price; paratype no. 17, ♀, Colorado, F. H. Snow; paratype no. 18, ♂, Estes Park, Colorado, July, 1892, F. H. Snow; paratypes numbers 19, 20, 21, 22, ♀ ♀, Colorado, collected by Bruce, from the Strecker Collection; paratypes numbers 23 through 36, ♂ ♂ and ♀ ♀, Deckers, Douglas County, Colorado, July 10 and July 18, 1938, C. D. Schryver. Holotype, allotype and paratypes numbers 1, 2, 5 through 8, 11, 12, 15, 16 and 23 through 32, 33, and 34 in the author's collection. Paratypes numbers 3, 4, in the collection of C. D. Schryver, Denver, Colorado. Paratypes numbers 9 and 10 in the collection of J. W. Tilden, Santa Cruz, California. Paratypes numbers 13 and 14 in the collection of F. C. Cross, to be deposited by him in the Denver Museum of Natural History. Paratypes numbers 17, 18, 35, 36 in the Francis Huntington Snow Entomological Collections, University of Kansas, Lawrence. Paratypes numbers, 19, 20, 21, 22 in the Strecker Collection of the Field Museum of Natural History, Chicago, Illinois.

Everes comyntas (Godart)

This species displays seasonal dimorphism. Typical **Everes comyntas** is the form common in the summer. The

females are brown or black brown above with two marginal black spots in the anal region of the hind wings in interspaces M^3 and Cu^1. These black spots are capped above with orange. Underneath they are grayish white in ground color. There is a marginal series of dark points and a submarginal series of dark bars around the outer margins of the wings. The marginal points in interspaces M^3 and Cu^1 of the hind wing are black with suffused rims of metallic green and silver and with orange crescents above. Sometimes there is a little orange above the marginal spot in interspace M^3. There is a submesial series of black spots crossing both pairs of wings, a bent bar at the end of the cell in the fore and hind wings and three black spots across the base of the hind wing. All of these spots are ringed with pure white. The males are similar to the females on the under surface but usually have only two orange crescents in the hind wing. The males are violet blue above with dark brown borders around the outer margins. These borders are usually about one millimeter in width. There is a very faint series of dark points in the marginal border of the hind wing. The point in interspace Cu^1 is darker than the others and may be very faintly outlined on the inner side by orange. Occasionally the same condition obtains in the point in interspace M^3. Underneath the males usually differ slightly from the females in having a little less of the marginal orange in the hind wing, so that while there are usually three of these orange spots on the under surface of the hind wing, the males usually have only two of these.

Everes comyntas f. meinersi f. nov.

This is the spring brood of **Everes comyntas,** and it differs quite consistently from the summer broods in a number of characters. The females are slightly darker, being almost black on the upper surfaces. This color is greatly suffused with blue in most specimens; however, this suffusion varies from a few blue scales in the base of the wings to an almost complete suffusion of blue over both pairs of wings. The blue coloration is almost lacking in the apices of the fore wings. There is a complete series of dark dots along the outer margins of the hind wing. The dots in interspaces M^3 and Cu^1 are black and capped with small orange or pinkish crescents. The rest of the marginal dots are surrounded by blue. There is a sub-

marginal series of brownish black bars. Underneath the ground color is lighter than in the summer form and with the maculation much less distinct. This is particularly noticeable in the marginal and submarginal markings of both pairs of wings. There are two instead of three orange crescents in the anal region of the hind wing. The males above are violet-blue with very thin brownish marginal lines. These lines are much less than one millimeter in thickness. In the hind wing the marginal black spots are more distinct than in typical **comyntas.** The marginal black spots in interspaces M^3 and Cu^1 are capped with small but distinct pink crescents. The pink crescent in interspace M^3 is sometimes absent. As in the females the males are paler unneath than in typical **comyntas** and with less distinct marginal markings.

This form is named after Dr. E. P. Meiners of St. Louis, Missouri, the first worker to notice that this species displays seasonal variation (The Dimorphic Blue Female of Everes Comyntas Godt., Ann. Ent. Soc. Am., vol XXIX, pp. 620-621, Dec., 1936). Dr. Meiners, however, thought that this variation was limited to the female sex. The writer has a large series of specimens of both forms from Reading, Pennsylvania; Barberton, Ohio; Aurora, Illinois; Herman, Missouri; Platte City, Missouri; Eureka, Kansas and Lawrence, Kansas. Both sexes very clearly separate into the two forms as decribed above.

Types.—Holotype, ♀, and allotype, ♂, Lawrence, Kansas, April 18, 1936, W. D. Field; paratypes numbers 1 through 34, mixed sexes, same locality and collector, various dates between April 18 and May 3, 1936. One pair of paratypes to be deposited in each of the following museums: Field Museum of Natural History, Chicago, Illinois; U. S. National Museum, Washington, D. C.; American Museum of Natural History, New York City; Los Angeles Museum, Los Angeles; Canadian National Museum, Ottawa; F. H. Snow Entomological Collections, University of Kansas, Lawrence; F. M. Brown Collection, Colorado Springs, Colorado. Holotype allotype and remainder of paratypes in the author's collection.

SOME NEW GRAPTOCORIXA FROM MEXICO AND OTHER NOTES

(CORIXIDAE-HEMIPTERA)

H. B. HUNGERFORD, Lawrence, Kansas*

The genus Graptocorixa was established by me in 1930 for a group of species typified by **Corixa abdominalis** Say. (Pan-Pacific Entomologist, Vol. VII, pp. 22-23). At that time I could see no reason for considering **C. bimaculata** Guerin more than a variety of **Graptocorixa abdominalis** (Say), but believed it to be a variety and not a synonym as treated by Uhler, who was followed by Champion, Van Duzee, and others. Recently I have had the opportunity of studying rather long series of these closely related and confusing forms and find some controlling structural characters that separate them quite readily into specifically different forms. There never has been any difficulty in sorting out typically marked specimens of **G. bimaculata** Guerin with the conspicuous white spots at the tip of the corium, but our perplexity arose when we encountered specimens of **G. bimaculata** (Guerin) with the white spots greatly reduced or specimens of **G. abdominalis** (Say) in which the pale bars at the tip of the corium became confluent, resulting in pale spots. Besides a consistent difference in the shape of the right claspers of the males and in the male palae, these two forms may be distinguished as follows:

A. White spot at distal angle of corium absent or only an irregular pale area. Basal segments of abdominal venter usually reddish. Middle femur of male with a close set row of short pegs on caudoventral margin. Middle femur of female with two or three rows of procumbent pegs on ventral surface ..... **G. abdominalis** (Say)

AA. White spot at distal angle of corium nearly always present. Basal segments of abdominal venter not often reddish. Middle femora lacking the rows of pegs described for **G. abdominalis.** .... **G. bimaculata** (Guer.).

Until I came upon the new species **Graptocorixa thomasi** Hungerford (Jl. Kansas Ent. Soc. XI, pp. 28-30,

*Contribution from the Dept. of Entomology, University of Kansas.

1938) with its unique male pala, the slender tapering pala appeared to be one of the strikingly characteristic features of the genus. However, two of the species (**G. robusta** and **G. ruina**) described below either do not belong in Graptocorixa or our generic concept must be modified.

Graptocorixa uhleroidea n. sp.

Size: Length 9.8 to 10.5 mm.; width across head 3 mm. to 3.3. mm.

Color: General color dark above; abdominal dorsum more or less red, the caudal end dark to black. Sternum black; venter of abdomen yellow in females to nearly black in some males; head and legs yellow except basal third of hind femora which are brown. Pronotum crossed by fourteen to sixteen dark bands that are somewhat irregular and incomplete and about as wide as intervening pale lines. The hemelytra crossed by wavy bands the dark ones wider than the light ones except at the base of clavus. At distal end of corium the dark bars usually interrupted or erased to produce a small irregular pale area; the wavy barring of the membrane more or less complete. Basal half of embolium pale; irregular sooty patch at embolial suture, most of embolial margin checkered.

Structural Characteristics: The so-called beak reduced. Frontal depression of male oval, not reaching the eyes and the area in both sexes covered with a dense patch of long silvery hair. Faint median longitudinal carina on pronotum more distinct in anterior portion. Pronotum, clavus and corium rastrate. Front femur roundly, but not greatly, produced at base with tuft of long bristles on anterior face of produced portion in both sexes. In one entire series from Monrovia Canyon, California, 3-2-1930, the males have shed these spines leaving three or four rows of lunate sockets where the bristles stood. Pala long and slender, slightly curved, and ending in stout claw. The male pala with a row of 33 pegs extending from base to tip. Middle and hind legs stout. Strigil of male large, straight on inner margin, rounded on outer margin—about twelve striae, outer ones short. Male genital capsule with right clasper broader on basal half and left clasper more pointed than in **G. uhleri.** Anal lobes of female deeply notched on inner ventral margin.

Location of Types: Holotype, allotype and paratypes in University of Kansas collection. Described from 19 males and 21 females labeled "Monrovia Canyon, California, March 2, 1930, C. H. Martin." In addition we have the following records: "Mission Creek, Santa Barbara, Cal., 1915, C. H. Kennedy." (Cornell Collection); "Alpine, Calif., July 9, 1929, Paul W. Oman"; "Bautista Can., Calif., April 8, 1931, C. H. Martin"; "San Diego Co., Calif., July 4, 1929, L. D. Anderson and P. W. Oman."

Comparative Notes: The name is suggested by the similarity of the male clasper to that of **G. uhleri** Hungerford. The species in other respects is near **G. californica** Hungerford from which it differs by having the base of the anterior femora definitely but not greatly produced at base.

Graptocorixa gentryi n. sp.

Size: Length 7.2 mm. to 7.5 mm.; width of head 2.34 mm. to 2.55 mm.

Color: General color dark; pronotum crossed by nine or ten dark bands about as wide as the pale interspaces; hemelytra crossed by wavy somewhat broken bands, the dark ones on the whole slightly broader than the pale ones, except at the inner base of the clavus; the pattern continuing over the membrane but sometimes separated from the corium by a pale streak. Venter may be light or dark. Head and legs pale except the distal half of the palae, the tibiae and tip of tarsi of middle legs usually dark.

Structural Characteristics: Frontal depression of male broadly oval nearly attaining margin of eye and covered with inconspicuous depressed pile of white hair. Female face rounded. Prothoracic lobes rather elongate and obliquely truncate. Metaxyphus longer than broad. Pala typical of the genus and ending in strong claw, the male pala with row of about 36-38 pegs. Middle tarsus slightly longer than the tibia. Male strigil of moderate size with four striae and genital capsule as shown on Plate.

Location of Types: Holotype, allotype and 7 paratypes in Francis Huntington Snow Collections, University of Kansas. Series labeled "San Bernardo, Rio Mayo, Sonora, Mexico, October 14, 1934, H. S. Gentry."

Comparative Note: This species which is about the size of **G. serrulata** (Uhler) is readily distinguished from it by the narrower post ocular area of the head, by the prothoracic lobe which is broader and more obliquely truncate as well as by the more slender and tapering male pala.

Graptocorixa gentryi devlini n. var.

This form is in nearly every regard like the above species but the right clasper of the male is different. The collection contains three specimens labeled "Cuantha Morelos, Mexico, Oct. 12, 1936, H. D. Thomas" from which the holotype and allotype are chosen and two specimens labeled "El Sabino, Uruapan, Mich., Mexico, July 28, 1936, H. D. Thomas." One of these is a male and its right clasper is identical with that of the type. This may prove to be specifically distinct from **G. gentryi** when longer series are available for study.

Graptocorixa henryi n. sp.

Size: Length 6.3 mm. to 6.6 mm.; width of head 2.16 mm. to 2.25 mm.

Color: Moderately dark, a little lighter and less contrastingly marked than in **G. serrulata** Uhler; the pronotum crossed by eight or nine brown lines usually narrower than the pale interspaces and the last four more or less broken; the dark barring of hemelytra wavy, somewhat interjoined and on the whole very slightly broader than the pale interspaces; head and legs yellowish to light brown; venter of same color, somewhat infuscated.

Structural Characteristics: Frontal depression of male broadly oval and covered with a pile of depressed white hairs. Female face rounded with the white hairs more sparsely covering the area. Interocular space narrow, plainly less than width of eye as measured by projection. Post ocular strip (behind the eyes) of uniform width. Prothoracic lobes rather elongate and rounded at the tip. Metaxyphus distinctly longer than broad. Anterior femur not produced at base; the pala typical of the genus and ending in stout claw; the male with a row of about 32 pegs on pala; the middle tarsus no longer than its tibia. The male strigil circular in outline and consisting of about seven striae. The gential capsule as shown on Plate.

Location of Types: Holotype, allotype and paratypes in Francis Huntington Snow Entomological Collection, University of Kansas. Described from 9 males and 8 females labeled "El Sabino Uruapan, Mich. Mex., Aug. 2, 1936, H. D. Thomas."

Comparative Notes: This species is near **G. melanogaster** Kirk. from which it differs by its smaller size and narrower interocular space; from **G. serrulata** (Uhler) it differs by its more elongate metaxyphus and from **G. gentryi** Hungerford by its rounded prothoracic lobe.

In addition to the above which are typical Graptocorixa, we have the following two, which I assign tentatively to this genus:

Graptocorixa robusta n. sp.

Size: Length 7.74 mm. to 8.4 mm.; width of head 2.9 mm. to 3 mm. A robust species.

Color: General color dark, the dark bands typically black and the pale bands ivory white; the pronotum crossed by twelve or thirteen dark, narrow, somewhat broken, bands that are broader than the pale interspaces; the wavy cross bands of the hemelytra with the dark bands broader except at inner angle of the clavus and near the tip of the corium; on the latter region the dark bands more or less erased leaving an irregular pale area; across the midsection of clavus and corium the black bands three or four times as broad as the pale ones; on the membrane the pale bands broader; base, midsection, and tip of embolium black; venter of thorax black with lighter margins; abdomen brown to blackish; the facial area dark brown, the pigment extending laterally below the eyes to the hypo-ocular septum and dorsally as a median stripe between the eyes; the legs shining, dark brown except basal half of palae which are white, the middle tarsi, the distal half of first segment of the hind tarsus and all of the second which are light brown.

Structural Characteristics: Frontal depression of male rather shallow, covered with depressed pile of fine white hairs; female face not depressed and sparsely covered with fine white hairs. Inter-ocular space narrow, about three-fourths the eye width measured in projection; post ocular strip widest at inner angle of

the eye. Lateral lobe of the prothorax rather elongate and obliquely truncate. Metaxyphus little longer than broad. Anterior femur not produced at base. The pala of male elongate but longitudinally compressed into a thin strip dorsally, bearing beneath its inner margin a row of 15 elongate pegs; the terminal claw moderately stout. The female pala typical for the genus. Middle and hind legs stout. The middle tarsus a little longer than its tibia. The male strigil small. The genital capsule as shown on Plate.

Location of Types: Holotype, allotype and paratypes in Francis Huntington Snow Collections. Described from three males and four females labeled "Acapulco, Guerrero, Mexico, July 14, 1937, H. D. Thomas." I have had for several years a teneral male labeled "Arroya S. Marcial, District Alamos, Son. Mexico, October 28, 1934, H. S. Gentry." This shows a rather wide range for this curious Mexican species.

Comparative Notes: This unique species agrees with **G. thomasi** Hungerford in having a relatively long middle tarsus and a male pala that digresses from the generic type. The rastrate surface, the color pattern of the hemelytra, the stout legs and the head characters are typically Graptocorixa.

Graptocorixa ruina n. sp.

Size: Length 10.8 mm.; width of head 3.45 mm.

Color: This teneral specimen cannot be used for any typical color picture. The pronotum is crossed by 15 brown bars, slightly narrower than the intervening pale ones. The wavy barring of the hemelytra indicating the brown bands slightly broader. The distal angle of the clavus with one brown bar erased.

Structural Characters: Male facial depression shallow, covered sparsely with a pile of fine white hairs. Prothoracic lobe unusually broad, the rear margin shorter than the distal and rounding into it. Metaxyphus a little longer than broad. The anterior femur of the male ventrally produced beyond its middle on the front face of which is an oblqiue, compact row of seven long bristles; the pala in this shriveled specimen is somewhat warped, but the arrangement of the row of pegs which curves back upon itself at the base is character-

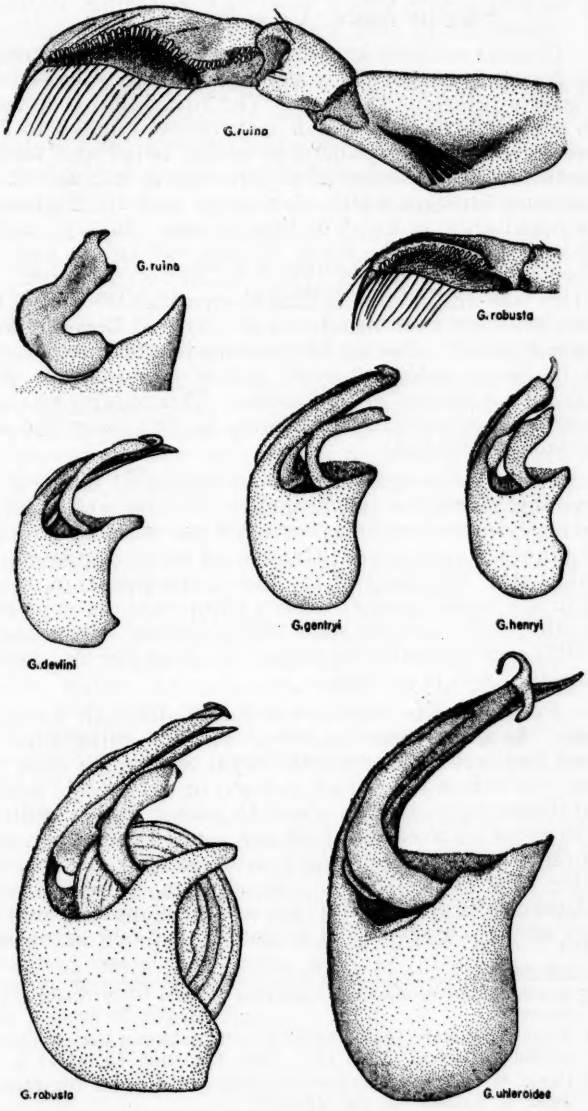
istic. The middle femur is thickened on its distal half, the beginning of the thickened portion marked by a row of conspicuous long hairs. Middle tarsus distinctly longer than its tibia. The caudoventral margin of hind femur with a row of 18 pegs, their size increasing to the distal end of the row. The male strigil with four striae and protected on its right side by the strongly sclerotized overlapping fold of a connexival lobe. The anal lobes asymmetrical, the right one smaller with a thickened tuft of hairs on its inner margin and the left lobe with two hooklike flaps extended from its inner dorsal margin and a notch in its inner ventral margin. The genital capsule collapsed in this specimen, the right clasper now appearing as shown on Plate.

Location of Type: Holotype in Francis Huntington Snow Collections and labeled "Arroyo Marcial, District Alamost, Son. Mexico, Oct. 28, 1934, H. S. Gentry." This specimen taken same date and place as the specimen of **G. robusta** Hungerford.

Comparative Note: The shape of the front femur of the male is like that of **G. thomasi** Hungerford and the modifications of the anal lobes and the shielded strigil also show a relationship to **G. thomasi** Hungerford.

Explanation of Plate.

1. **Graptocorixa ruina** new species. Front leg of male.
2. **Graptocorixa ruina** new species. Right clasper.
3. **Graptocorixa robusta** new species. Male pala.
4. **Graptocorixa devlini** new species Male genital capsule.
5. **Graptocorixa gentryi** new species. Male genital capesule.
6. **Graptocorixa henryi** new species Male genital capsule.
7. **Graptocorixa robusta** new species Male gentital capsule.
8. **Graptocorixa uhleroidea** new species. Male genital capsule.


G. ruina
G. ruina
G. robusta
G. gentryi
G. henryi
G. devlini
G. robusta
G. uhleroidea

A CICADA AS A COTTON PEST (1)

DWIGHT ISELY, University of Arkansas

Cicadas are best known for their periodic occurrence and for their song. They are not ordinarily considered as insects injurious to crops. The principle exception is the periodical cicada which may cause damage to fruit trees by oviposition punctures in the twigs and smaller branches. This damage is of importance because of the enormous numbers which may occur and not because of any peculiarity in habit of this species. Injury caused depositing eggs in the stems of corn and cotton was described by Newell (2) in 1905. In Newell's paper the species was designated as **Cicada erratica** Osborn but this name has since been listed as a synonym of **Diprocta vitripennis** Say (3). During 1937 severe local damage to cotton by this species occurred in the river bottoms of at least nine counties of Arkansas. This injury was also caused by oviposition punctures, as has been the case previously reported.

The eggs of **vitripennis** were deposited in the stems of young plants, in the branches of older ones and occasionally in leaf petioles. Above the point of puncture the plants usually died. Growth of many plants started again below the point of the locust egg puncture, resulting in low bushy plants. These plants were later in coming into production but since the latter part of the season of 1937 was favorable to cotton, much of the loss expected in July was recovered.

As stated the injury was local, although severe in spots. As an extreme example, on one plantation of about 450 acres in Lee County in the St. Francis river bottoms, the cotton was killed outright or so severely injured that it was plowed up on about 15 acres. On an additional 30 acres an average of 50 per cent of the plants were injured. Much of the injury on these 30 acres was outgrown later in the season. In addition, there was some scattered injury. The damage on this plantation was the most severe observed. It is doubtful if 500 acres were

(1) Research Paper No. 617, Journal Series, University of Arkansas.

(2) Newell, Wilmon, 1906. Notes on a little known insect enemy of cotton and corn. U. S. D. A. Bur. Ent. Bul. 60, 52-58 p.

(3) Davis, W. T. 1928. Cicadas belonging to the genus Diptrocta. . Jour. N. Y. Ent. Soc. 36: 439-456.

injured in this county. Reports and specimens from nine counties indicated that local injury was scattered over the bottomlands of the eastern part of the state. One report was from the southwestern part.

This cicada is apparently not dependent on tree hosts for the development of its immature stages. On one plantation the nymphs had emerged from the soil in cotton fields that had been in cultivation since some time before the Civil War. There was a relationship between an abundance of cicadas, however, and trees or woody plants in the vicinity. All of the spots of injury observed were in bottomlands and in the vicinity of trees with a thick undergrowth of brush, although not necessarily adjacent to it. The cicadas remained in this cover during the night and cooler parts of the day. They began to fly from cover after eight o'clock in the morning, and activity in flying, oviposition and singing increased with the increase in temperature. The activity was greatest during the heat of the day. The season of activity was about a month, beginning the second week in June. It attracted most attention during the last week of June.

While more of the oviposition appeared to be in cotton than in any other plants, on terminals of trees and other plants dead foliage presented obvious evidence of injury. The woody plants preferred for oviposition in order of importance appeared to be as follows: soft maple, willow, honey locust, black locust, **Amorpha** sp., pecan, hackberry, and trumpet vine. Of the herbaceous hosts, morning glory was next in importance to cotton. The number of eggs in a single series of punctures varied from 16 to 49.

The heavy infestation of **D. vitripennis** in 1937 may have been favored by the lateness of cotton in the bottoms. An early spring flood had delayed cotton planting and the usual early cultivation. Had the cotton been plowed and hoed earlier, it is probable that many of the nearly mature nymphs near the surface of the soil would have been destroyed. Since many of the cicadas emerged from the soil in the cotton fields, this points to a possible means of repression.

A NEW METHOD OF FEEDING ADULT HORN FLIES, HAEMATOBIA IRRITANS L., AND STABLE FLIES, STOMOXYS CALCITRANS L.

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The artificial feeding of horn flies, **Haematobia irritans** (L.), and stable flies, **Stomoxys calcitrans** (L.), has often been accompanied by considerable time-consuming labor and no little dissatisfaction. This is especially true where small animals are used as the source of blood supply. By providing blood in glass tubes and by utilizing the insects' positive phototropism, a rapid, inexpensive, and satisfactory method of feeding these two species of blood-sucking flies has been developed.

For maintaining the flies, a cage (fig. 1) 6 inches deep, 12 inches wide, and 16 inches long has been found to be satisfactory. The sides of the cage (fig. 1, A) are made of ¾-inch lumber, the bottom of 26-gauge galvanized sheet iron, and the top (fig. 1, B) of 18-mesh galvanized wire screen. A sliding door (fig. 1, C) 5 by 5 inches in one side permits access to the interior of the cage. Approximately 500 horn flies or 250 stable flies can be conveniently handled in a cage of this size. A galvanized sheet-iron cover (fig. 1, D) 8 by 12 inches fits over one-half of the cage. Soldered to the cover about 1 inch from the end is a feeding-tube rack (fig. 1, E) made of 26-gauge galvanized sheet iron 3 inches wide, 3 inches high, and 9 inches long, in which six equidistant holes one-half inch in diameter are bored. Immediately below the feeding-tube rack is an opening in the cover three-fourths inch wide and 7 inches long. This opening admits light into the cage and provides a place for the feeding tubes to come in contact with the screen. Six glass tubes (fig. 1, G), 6 to 8 mm in inside diameter, 10 cm long. and fitted on one end with a medicine-dropper bulb (fig. 1, H), are placed in a vertical position through the holes in the feeding-tube rack and in contact with the screen of the cage.

Three tubes of blood at a temperature of 25 degree to 40 degrees C. and three tubes of water are ample for one feeding. Horn flies seem to feed best on defibrinated bovine blood. Stable flies feed on defibrinated

blood, and also thrive on acidulated bovine or swine blood. Two feedings per day are sufficient.

Horn flies thrive best in an environment of high humidity. A wet cloth or towel placed over the uncovered half of the cage will supply the necessary moisture. Stable flies are less sensitive to adverse conditions than are horn flies. They do not require as high humidity, though water for drinking must be constantly available. The wet cloth and metal cover occlude light from the cage except that which enters through the slot in the cover. The unfed flies will congregate on the screen under this slot and will readily find the food supply. As the flies become engorged they move away from the light, allowing other flies to feed. It is well to add that fresh air is essential to the life of caged horn flies and that tobacco smoke is lethal.

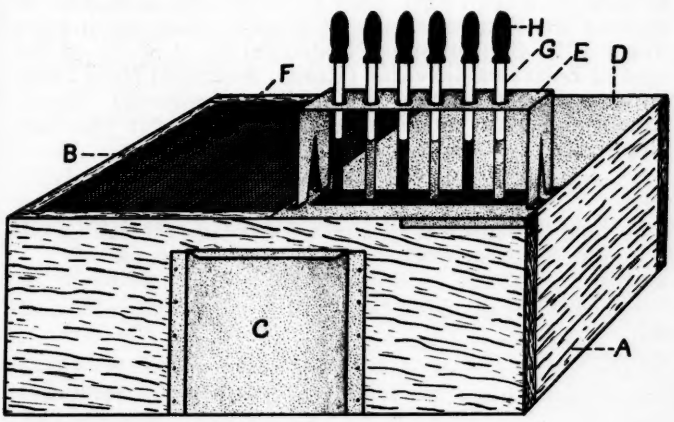

Fig. 1.—Cage for horn flies and stable flies. A, Cage. B, 18-mash galvanized wire screen. C, Sliding door. D, Galvanized sheet-iron cover. E, Feeding-tube rack. F, Uncovered half of cage. G, Glass tube. H, Rubber bulb.

ELMIS COLUMBIENSIS ANGELL A SYNONYM OF ZAITZEVIA PARVULUS (HORN)* [1]

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Zaitzevia parvulus (Horn)

Macronychus parvula Horn, Trans. Am. Ent. Soc., III: p. 41, 1870.

Elmis columbiensis Angell, Ent. News, III: p. 84, 1892.

At the time of its description, Horn assigned **parvulus** to the genus Macronychus supposedly by the presence of seven antennal segments. However, the actual presence of eight segments places it with Zaitzevia Champion. In 1892, **Elmis columbiensis** Angell was described from Fraser River Valley, British Columbia. Apparently Angell did not designate types of this species, but specimens collected at type locality and determined as such by Angell have been found in the collections of the late Mr. Warren Knaus, McPherson, Kansas, and the Henry Ulke Collection at Pittsburgh, Pa. A study of the type of **Zaitzevia parvulus** (Horn), described from California, and the specimen of **Elmis columbiensis** Angell from the Knaus collection convinces me that they are identical.

* Research Paper No. 500, Journal Series, University of Arkansas.
1 Coleoptera: Dryopidae.

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